# The MIND HASNO SEX?

Women in the Origins of Modern Science

LONDA SCHIEBINGER

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# Introduction

L'esprit n'a point de sexe.

—François Poullain de la Barre, 1673

hen the ardent Cartesian Poullain issued this declaration, that "the mind has no sex," he based his argument on the new science of anatomy. Women have sense organs similar to men's and brains with the same power of reason and imagination, so why, he asked, should they not be the equals of men, serving as professors, judges of the court, military officers, or ambassadors? Poullain's words reverberated across all of Europe. A woman chemist cited them in 1674 to defend her publication; a literary man invoked them in 1884 in support of women's admission to the Académie Française.

This popular refrain did not go unchallenged, however. In the days preceding the French Revolution, anatomists and medical doctors asserted that the mind does indeed have sex, and that sex extends "through more or less perceptible nuances into every part of the body"—including the brain.¹ William Whewell, in 1834, in the same paper in which he coined the term *scientist*, assured his readers that "notwithstanding all the dreams of theorists, there is a sex in minds."² Women, so these scholars taught, are essentially different from men, and female nature destines women ("the sex" as they were often called) for lives as mothers, confined to hearth and home.

The question of male and female equality in the sphere of intel-

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lect has proved an enduring one. Nowadays we ask, as have others before us, why are there so few women scientists? In the seventeenth century, the English natural philosopher Margaret Cavendish spoke for many when she wrote that women's brains are simply too "cold" and "soft" to sustain rigorous thought. The alleged defect in women's minds has changed over time: in the late eighteenth century, the female cranial cavity was supposed to be too small to hold powerful brains; in the late nineteenth century, the exercise of women's brains was said to shrivel their ovaries. In our own century, peculiarities in the right hemisphere supposedly make women unable to visualize spatial relations.

It seems unnecessary, however, to jump to rigidly biological explanations when one considers the obstacles that have been thrown in women's paths. For centuries, women were barred from academies and universities for no reason other than their sex. Those few who were able to succeed in science often failed to enjoy the recognition of that office: Marie Curie, the first person ever to win two Nobel prizes, was denied membership in the prestigious Académie des Sciences in 1911 because she was a woman. A woman was not elected to full membership in the academy until 1979, more than three hundred years after it first opened its doors.

Perhaps we should be asking a different question: why are there so few women scientists that we know about? Perhaps women have been scientists in the past but their stories have not been remembered. Or perhaps women have dominated certain fields but these fields have not been recognized as science. As long ago as 1830, the German physician Christian Harless lamented the "longstanding gap in the history of the natural sciences . . . There has been no historical and evaluative survey of all the women who, from the earliest times until our own, have distinguished themselves in the various sciences." How long has the problem of women in science been a problem—how many times has the battle been fought, lost, and then forgotten? Science is not a cumulative enterprise; the history of science is as much about the loss of traditions as it is about the creation of new ones.

My purpose in this book is to explore the long-standing quarrel between science and what Western culture has defined as "femininity." What is it about being a woman that has made men of science fearful of female intrusion? What is it about science that has made it susceptible to such fears? To answer these questions I analyze the rise of modern science in Europe in the seventeenth and eighteenth centuries, focusing especially on the circumstances that led to the exclusion of women. In the seventeenth century science was a young enterprise forging new ideas and institutions. Men of science at this time can be seen as standing at a fork in the road. They could either sweep away the traditions of the medieval past and welcome women as full participants, or they could reaffirm past prejudices and continue to exclude women from science. What were the social, political, and intellectual circumstances that directed science down one road? What was the cultural cost of that journey?

The project of writing histories of women in science is not an entirely new one. As early as 1405, Christine de Pizan asked if women had made original contributions in the arts and sciences:

I realize that you are able to cite numerous and frequent cases of women learned in the sciences and the arts. But I would then ask whether you know of any women who . . . have themselves discovered any new arts and sciences . . . which have hitherto not been discovered or known. For it is not such a great feat of mastery to study and learn some field of knowledge already discovered by someone else, as it is to discover by oneself some new and unknown thing.<sup>4</sup>

De Pizan's "Lady Reason" gave the answer of many modern historians of women: "rest assured, dear friend, that many great and noteworthy sciences and arts have been discovered through the understanding and subtlety of women, both in cognitive speculation, demonstrated in writing, and in the arts, manifested in manual works of labor."

De Pizan's celebration of the heritage of intellectual women was not unique. The first major histories were presented in the form of encyclopedias; from Giovanni Boccaccio's *De claris mulieribus* (1355–1359) through the eighteenth century, the names of women learned in the arts and sciences were collected largely in an attempt to prove that there were indeed more accomplished women than had been previously imagined.<sup>5</sup> It was not until the late eighteenth century, however, that the first encyclopedia appeared devoted exclusively to the history of women's achievements in the natural sci-

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ences. In 1786 the French astronomer Jérôme de Lalande included in his Astronomie des dames the first short history of women astronomers.<sup>6</sup> Fifty years later, in his Verdienste der Frauen, Christian Harless emphasized that both men and women are capable of doing science. "It is not exclusively for the man to research nature, to penetrate her creations with a keen eye and to enjoy her charms with unending passion. Sensitive women may also perceive her endless magic." At the same time Harless identified what he thought were significant differences between men's and women's relationship to nature. Man, he wrote, as soon as he is moved by the spirit, searches to uncover causes underlying appearances, seeking to discover laws in life and nature. Woman, by contrast, searches nature over for expressions of love—this, he concluded, is the more natural and most beautiful way to approach the external world.

The European women's movement of the 1880s-1920s drew attention once again to the question of women's ability to contribute to the sciences. In 1888, a journal entitled La Revue scientifique des femmes was founded in Paris. In 1894, the Saint-Simonians in Paris held the first conference in modern times on women and science, from which grew Alphonse Rebière's book, Les Femmes dans la science.8 That same year Elise Oelsner published her Leistungen der deutschen Frau (Achievements of the German woman), in which she paid close attention to women's scientific achievements.9 By this time, however, the encyclopedia format employed in these books no longer served as an effective strategy for proving that women had indeed been great scientists. Antifeminists—such as Gino Loria in Italy-pointed out that even if there were enough distinguished women to fill three hundred pages, an equivalent project for men would run to three thousand pages. What woman, Loria asked, can rival Pythagoras or Archimedes, Newton or Leibniz?10

In response to this kind of criticism, European and American feminists turned from the strategy of emphasizing the achievements of exceptional women and began to emphasize instead the *barriers* to women's participation in science. The first detailed work of this sort was published in America in 1913 by H. J. Mozans (a pseudonym for the Catholic priest J. A. Zahm) under the title *Woman* 

in Science. It was an impassioned attempt to show that whatever women have achieved in science has been through "defiance of that conventional code which compelled them to confine their activities to the ordinary duties of the household." Mozans urged women to join the scientific enterprise and thereby unleash half the energies of humanity. He expected each woman to act as a Beatrice inspiring her very own Dante to achieve his full potential; in this way, man and woman would complement each other and together form a perfect androgyne. Only then would the world enter a new golden age, the golden age of "science and perfect womanhood." 11

The works of de Pizan, Harless, Oelsner, Rebière, and Mozans are landmarks in the field of the history of women in science. Yet it should be noted that these authors, who wrote about outsiders, were also themselves by and large outsiders. Within the academy, as might be expected, the study of women in science was no more welcome than were women scientists. Despite scattered interest since the time of Christine de Pizan, records of women's contributions did not become part of the historical canon.

Nor was this picture to change with the emergence of the modern discipline of the history of science in the 1920s and 1930s. This new field, purporting to study the relation between science and society, did not consider the role of women in science. Even the women working in the field-Marie Boas Hall, Martha Ornstein, and Dorothy Stimson—paid little attention to women's participation in the sciences. None of the major theorists exploring the social origins of modern science—Robert Merton, Edgar Zilsel, Boris Hessen—made any mention of women. Historians studied participation in science from many important vantage points—religious affiliation, class, age, vocation—but ignored entirely questions of gender. Merton, for example, in his pioneering work on seventeenth-century English science, pointed out that 62 percent of the initial membership of the Royal Society were Puritan. 12 He did not, however, explore the implications of the even more striking fact that the early membership in the Royal Society, and indeed in all seventeenth-century academies of science, was 100 percent male.<sup>13</sup>

Since the 1970s, with increasing numbers of women entering both science and the historical profession, there has been a steadily growing interest in the history and philosophy of women in science. Women scientists have contributed thoughtful autobiographies giving firsthand accounts of their struggles to make a mark in science. It Intellectual biographies have appeared of Sophie Germain, Mary Somerville, Sofia Kovalevskaia, and Clemence Royer. These books assess the contributions of women to science and address an important set of questions: What sparked their interest in science? How did they obtain access to the tools and techniques of science? How did they make their scientific discoveries? What recognition did these achievements receive in the broader community of scholars?

Much of this work fits the "history of great men" mold, with women simply substituted for men. One problem with this brand of history is that it often retains the male norm as the measure of excellence. Margaret Rossiter's analysis of women scientists in America breaks from this mold by shifting the focus from the exceptional woman to the more usual patterns of women working in science.<sup>16</sup> Evelyn Fox Keller, though she retains the focus on an exceptional woman in her biography of Barbara McClintock, does not simply measure McClintock against traditional male standards but uses her story (told largely in McClintock's own words) as a vehicle for evaluating current methods of experimental science.<sup>17</sup>

Today we understand to a large extent how women have been excluded from scientific institutions. Yet, despite efforts made through affirmative action, the problem of women's limited presence in science has not disappeared. In recent years scholars from a variety of disciplines have concentrated on the problem of explaining the deeper mechanisms of exclusion. 18 Sociologists and historians have identified structural barriers, in both society and the institutions of science, that have impeded women's professional advancement.<sup>19</sup> Biologists have begun to unravel the "myths of gender" embedded in the female body.20 Philosophers and historians have begun to define gender-based distortions in the norms and practices of science and to discuss alternative epistemologies for the sciences.<sup>21</sup> This burgeoning literature has focused attention on how sexual differences have been cultivated by societies intent upon preserving sharp social and intellectual distinctions between the sexes. But what are the origins and implications of those differences? Should differences be celebrated or overcome? Are men

and women different by nature or by nurture? And what difference does difference make?

Understanding gender differences and how they operate in the world of science today requires a reexamination of the history of women in science. What role did the "woman question" and the debate over "female nature" play in the origins of modern science? In the following pages I shall be examining the revolution in European science that took place in the seventeenth and eighteenth centuries and the place of gender in that revolution. I have analyzed the problem into four constituent parts—institutional organizations, individual biographies, scientific definitions of female nature, and cultural meanings of gender. Rather than privilege any one of these as causal agents, I see them as interdependent parts of a dynamic system. My purpose is to bring together elements of what are sometimes seen as different historical methods—each of which is crucial for understanding women's place in scientific culture.

The first part of this study looks at the *institutions* of science as agencies mediating between science and society, with a focus on how gender boundaries were negotiated in universities and scientific academies of the seventeenth century. Medieval universities were closed to all but a few exceptional women. Modern science, arising outside of and in opposition to the medieval university, was fostered in academies, princely courts, Parisian salons, and the artisanal workshop—that is, in a social landscape expansive enough to include a number of women. Chapter 1 argues that in this period it was not at all obvious that women would be excluded from the new institutions of science.

The second part concentrates on women as historical actors maneuvering within the gender boundaries prescribed by society. A number of women experimented in early modern Europe with the limits of convention in order to secure their place among the men of science; chapters 2, 3, and 4 tell the stories of some of them. My method here is comparative; the diversity among women should not be ignored. Women's participation in science varied greatly from country to country, class to class, and town to town. Women scientists in this period came predominantly from two social groups—the aristocracy and the crafts. Chapter 2 looks at England and France, where the greatest contributions came from women of

the aristocracy. Noblewomen gained a limited access to science in the seventeenth and eighteenth centuries, much as they had access to political power and influence by virtue of their noble status. In Germany (Chapter 3), by contrast, women's scientific activities were prompted by their involvement in craft production. The strength of the artisanry in Germany may explain the remarkable fact that between 1650 and 1720 a sizable proportion (six out of forty-two) of German astronomers were women. In Chapter 4 I shift the focus to women's traditions in science. Women traditionally dominated the field of midwifery, for example, but with the scientific and social revolutions of the seventeenth and eighteenth centuries the "man-midwife" came to encroach upon that ancient monopoly. Finally, Chapter 9 traces the lives of some women in science at the close of this era; by the nineteenth century, women were effectively barred from the new institutions of science and restricted to the increasingly private sphere of the family, where they served as "invisible assistants" to brothers, husbands, or fathers.

The third part examines how the biological sciences have read and misread sex and gender (no real distinction was made by eighteenth-century anatomists) in women's bodies, and how these scientific readings of female nature were used to argue for or against the participation of women in science. Chapter 6 sets the stage by sketching the cosmological assumptions behind definitions of sex and gender in the ancien régime of science. One might expect dramatic changes in the understanding of woman's place in society and nature during the tumultuous years of the scientific revolution—a revolution which itself arose as part and parcel of larger movements toward participatory democracies. We find, however, that modern science—strident in its claims to displace the old—was curiously silent on the issue of gender. Not until deep into the eighteenth century did scientists (especially anatomists) undertake a thoroughgoing reform of definitions of sexuality, what in Chapter 7 I describe as "the scientific revolution in views of sexual difference."

The fourth part explores *cultural meanings* of femininity and masculinity and how understandings of gender became embedded in debates over women's ability to do science. One idea explored in this book is that femininity represents a set of values that has been excluded from science. Yet it is important to understand that femi-

ninity itself is profoundly historical. Chapter 5 examines how notions of gender often refer as much to the manners of a particular class or a particular nation as to those of a particular sex through two examples—the rise and fall of the feminine image of science, and the battles over intellectual style played out in the salons of Paris. Chapter 8 goes on to explore how the theory of sexual complementarity justified purging both women and what came to be defined as the feminine from the public world of science. Chapter 10, by way of conclusion, examines the self-reinforcing character of the gender system in science. Scientists helped crystallize gender roles by constructing views of men and women that bolstered emerging ideals of masculinity and femininity. Yet science and philosophy did not do so from a privileged vantage point untouched by social struggle—science was itself part of the terrain that divided the sexes. Ultimately we must ask: What were the consequences of the exclusion of women for the methods and priorities of science?

Though my focus is on women in the origins of modern science, my hope is that this book will also shed light on how gender relations have molded (and continue to mold) scholarship and knowledge more generally. The nature of science is no more fixed than the social relations of men or women: science too is shaped by social forces. One of those forces has been the persistent effort to distance science from women and the feminine. Shedding light on the origins of these efforts may help to add historical understanding to the problems of gender and science facing us today.